Status Report

on

Hydrologic Models for Land-Atmosphere Retrospective Studies of the Use of Landsat and AVHRR Data

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Status Report

I. Continuing Research

In the previous status report we discussed the use of a GIS (geographic information system) and Landsat analysis in conjunction with the SWRRB (Simulator for Water Resources on a Rural Basin) hydrologic model to examine the water balance on the Little Washita River basin. Much of the work described below was performed as part of a master's thesis by Tim Loesch.

In the research completed to date Landsat analysis was used to divide the basin into eight non-contiguous land-covers or subareas: rangeland, grazed range, winter wheat, alfalfa/pasture, bare soil, water, woodland, and impervious land (roads, quarry). The use of a geographic information system allowed for the calculation of SWRRB model parameters in each subarea.

Four data sets were constructed in order to compare SWRRB estimates of hydrologic processes using two methods of maximum LAI and two methods of watershed subdivision. Maximum LAI was determined from a continental scale map, which provided a value of 4.5 for the entire basin, and from its association with the type of land-cover (eight values). The two methods of watershed subdivision were determined according to drainage subbasin (four) and the eight land-covers given above.

These data sets were used with the SWRRB model to obtain daily hydrologic estimates for 1985. Each data set also included daily maximum and minimum temperatures, insolation and precipitation observations within and around the basin. In the case of precipitation the daily average over the entire basin was used for each subarea defined by land cover whereas in the other method the daily average for each subbasin was used.

The results of the one year analysis lead to the conclusion that the greater homogeneity of a land-cover subdivision provides better water yield estimates than those based on a drainage properties subdivision. In terms of maximum LAI delineation, the results indicate that the coarse method of determining maximum LAI is sufficient. However, this is a site specific result because only 20% of the Little Washita River watershed is covered by vegetation that has a maximum LAI of less than three. Thus, the effect of increasing the accuracy of maximum LAI values for use as input to the SWRRB model is very small for this area.

Some future research directions include incorporating a baseflow for the watershed in the SWRRB model, examining land-cover vs soil in defining homogeneous sub-areas, expanding use of the SWRRB model to regional watershed and, in relation to regionalization, examining the effects of larger grid cell databases on land-surface parameters and water yield estimates.

II. Presentations

A paper titled "Remote Sensing and GIS Refinement of the SWRRB Hydrologic Model" was given at the American Society of Photogrammetry and Remote Sensing in St. Louis, 13-18 March.

A similar presentation will be given at the American Association of Geographers annual meeting in Phoenix, 6-10 April.

III. Publications

Work is continuing on journal publications relating to a survey of the above type of GIS application, multidate classification using Landsat, land cover vs draingage basin watershed subdivision in hydrologic models and GOES insolation vs observed insolation.